L Number	Hits		DB	Time stamp
1	4355444	clock distribution circuit	USPAT;	2004/03/18 17:14
			US-PGPUB;	
			EPO; JPO;	
			DERWENT;	
			IBM_TDB	
2	2303156	phase detector\$1	USPAT;	2004/03/18 17:15
			US-PGPUB;	
			EPO; JPO;	
			DERWENT;	
			IBM_TDB	
3	453025	(clock distribution circuit) with (phase detector\$1)	USPAT;	2004/03/18 17:19
			US-PGPUB;	
			EPO; JPO;	
			DERWENT;	
	4642400		IBM_TDB	2004/02/40 47 24
4	1643180	generat\$3 and (clock signal\$1 with error signal\$1)	USPAT;	2004/03/18 17:21
			US-PGPUB;	
			EPO; JPO;	
			DERWENT;	
5	233141	((alask distribution singuit) with (abase detector(1)) and	IBM_TDB	2004/02/10 17:25
٦	233141	((clock distribution circuit) with (phase detector\$1)) and (generat\$3 and (clock signal\$1 with error signal\$1))	USPAT; US-PGPUB;	2004/03/18 17:25
		(Generacias and (Clock signals)	EPO; JPO;	
			DERWENT;	
			IBM_TDB	
6	4682306	loop filter circuit	USPAT;	2004/03/18 17:26
"	1002500	loop filter circuit	US-PGPUB;	2004/03/10 17.20
		,	EPO; JPO;	
	1		DERWENT;	
			IBM_TDB	
7	224627	(((clock distribution circuit) with (phase detector\$1)) and	USPAT;	2004/03/18 17:30
		(generat\$3 and (clock signal\$1 with error signal\$1))) and (loop	US-PGPUB;	200 1,00,10 2,100
		filter circuit)	EPO; JPO;	
			DERWENT;	
			IBM_TDB	
8	1221430	pulse generator\$1 and (pulse signal\$1 with clock signal\$1)	USPAT;	2004/03/18 17:33
			US-PGPUB;	
			EPO; JPO;	
			DERWENT;	
			IBM_TDB	
9	152267	((((clock distribution circuit) with (phase detector\$1)) and	USPAT;	2004/03/18 17:40
		(generat\$3 and (clock signal\$1 with error signal\$1))) and (loop	US-PGPUB;	
		filter circuit)) and (pulse generator\$1 and (pulse signal\$1 with	EPO; JPO;	
		clock signal\$1))	DERWENT;	
			IBM_TDB	1

			USPAT;	2004/03/18 17:42
		"6066969"	US-PGPUB;	
		"6088255"	EPO; JPO;	
		"4816700"	DERWENT;	
		"5870595"	IBM_TDB	
		"6041073"	-	
		"4475085"		
		"5212410"		
		"5630102"	İ	
		"5920222"		
		"5952857"		
		"6239647"		
		"4415984"		
		" 44 79216"		
		RE31828		
		"4613828"		
		"4801819"		
		"4905006"		
		"5210546"		
		"5257294" "5250333"		
		"5359232"	İ	
		"5459762"		
1	1	"5600839"		
		"5612980"		
		"5621705"		
		"5628019"		
		"5633879"		
		"5646672"		
		"5724360"		
		"5774321"		
		"5787261"		
		"5805603"		
		"5901116"		
Į		"6052004"	1	
		"6058152"		
1		"6078225"		
İ		"6094076"		
		"6160542"	1	
ŀ		"4361897"		
		"4375088"		
		"4376268"		
ļ		"4399412"		
1		"4454607"		1
		" 4499459"		
ļ		"4512028"		
		"4527075"		
Į		"4542347"		
ŀ		"4547667"		
į		"4557606"		
j		"4580047"		
		"4580046"		

	337	(((((clock distribution circuit) with (phase detector\$1)) and (generat\$3 and (clock signal\$1 with error signal\$1))) and (loop filter circuit)) and (pulse generator\$1 and (pulse signal\$1 with clock signal\$1))) and ("6066969" "6088255" "4816700" "5870595" "6041073" "475085" "5212410" "5530102" "5920222" "5920222" "5920222" "5920222" "4479216" RE31828 "4613828" "481819" "495006" "5210546" "5257294" "5359232" "556260839" "5612980" "5621705" "5628019" "5633879" "5628019" "5633879" "5628019" "5724360" "5774321" "5787261" "5805603" "5901116" "6058152" "6078225" "6094076" "4357608" "4375088" "4375088" "4375088" "4375088" "4375088" "4375088" "4375088" "4375088" "4376268" "4399412" "4454607" "4454607" "4454607" "44557606" "4557066" "457	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2004/03/18 17:42
12	70917	"4580046") summing and (error signal\$1 with composite error signal\$1)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2004/03/18 17:43

13	24	(generat\$3 and (clock signal\$1 with error signal\$1))) and (loop filter circuit)) and (pulse generator\$1 and (pulse signal\$1 with clock signal\$1))) and ("6066969" "6088255" "4816700" "5870595" "6041073" "4475085" "5212410" "5630102" "5920222" "5952857" "6239647" "4415984" "4479216" RE31828 "4613828" "4801819" "4905006" "5210546" "52577294" "5359232" "5459762" "5600839"	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2004/03/18 17:43
			İ	
	1	"5612980"		
	į	"5621705"		
		"5628019"		
	ļ	"5633879"		
		"5646672"		
		"5724360" "5774321"		
		"5774321" "5787261"		
		"5805603"		
		"5901116"		
	["6052004"		
		"6058152"		
		"6078225"		
		"6094076" "6160542"		
		"4361897"		
		"4375088"		
		"4376268"		
		"4399412"		
		"4454607"		
		"4499459"		
		"4512028" "4527075"		
		"4527075" "4542347"		
		"4547667"		
		"4557606"		
		"4580047"		
		"4580046"		
)) and (summing and (error signal\$1 with composite error		
14	3492556	signal\$1))	LICDAT.	2004/02/10 17:42
17	3432330	arbiter circuit\$1	USPAT; US-PGPUB;	2004/03/18 17:43
			EPO; JPO;	
			DERWENT;	
			IBM_TDB	

15		/////	LICOAT	2004/02/40 47 11
15	24		USPAT;	2004/03/18 17:44
		(generat\$3 and (clock signal\$1 with error signal\$1))) and (loop	US-PGPUB;	
		filter circuit)) and (pulse generator\$1 and (pulse signal\$1 with	EPO; JPO;	
		clock signal\$1))) and (DERWENT;	
		"6066969"	IBM_TDB	
		"6088255"		
		"4816700"		
		"5870595" "6044073"		
	1	"6041073"		
	İ	"4475085"		
		"5212410"		
		"5630102"		
		"5920222"		
		"5952857"		
		"6239647"		
		"4415984"		
		"4479216"		
		RE31828		
		"4613828"		
		"4801819"		
		"4905006"		
		"5210546"		
		"5257294"		
		"5359232"		
		"5459762"		
		"5600839"		
		"5612980"		
	1	"5621705"		
		"5628019"		
		"5633879"		
	1	"5646672"		
		"5724360"		
		"5774321"		
		"5787261"		
		"5805603"		
	1	"5901116"		
		"6052004"		
		"6058152"		
		"6078225"		
		"6094076"		
		"6160542"		
		"4361897"		
		"4375088"		
		"4376268"		
		"4399412"		
	1	"4454607"		
		"4499459"		
		"4512028"		
		"4527075"		
		"4542347"		
		"4547667"		
		"4557606"		
		"4580047"		
		"4580046"		
	[)) and (summing and (error signal\$1 with composite error		
	1	signal\$1))) and (arbiter circuit\$1)		
16	968045	synchronize local clock	LICDAT	2004/03/19 17:44
10	300043	Synchronize local clock	USPAT;	2004/03/18 17:44
			US-PGPUB;	
	1		EPO; JPO;	ł
		· ·	DEDIMENT.	
			DERWENT; IBM_TDB	

17	23	((((((((((((((((((((((((((((((((((((((USPAT; US-PGPUB; EPO; JPO; DERWENT;	2004/03/18 17:45
		"6066969"	IBM_TDB	:
		"6088255" "4816700"		
		"5870595"		
		"6041073" "4475085"		
		"5212410"		
		"5630102"		
		"5920222" "5952857"		
		"6239647"		
		"4415984"		
		"4479216" RE31828		
		"4613828"		
		"4801819"		
		"4905006" "5210546"		
		"5257294"		
		"5359232"		
		"5459762" "5600839"		
		"5612980"		
		"5621705"		
		"5628019" "5633879"		
		"5646672"		
		"5724360" "5774334"		
		"5774321" "5787261"		
		"5805603"		
		"5901116" "6052004"		
		"6052004" "6058152"		
		"6078225"		
		"6094076" · · · · · · · · · · · · · · · · · · ·		
		"4361897"		
		"4375088"		
		"4376268" "4399412"		
		"4454607"		
		"4499459"		
		"4512028" "4527075"		
		"4542347"		
		"4547667"		
		"4557606" "4580047"		
		"4580046"		
)) and (summing and (error signal\$1 with composite error signal\$1))) and (arbiter circuit\$1)) and (synchronize local clock)		
18	225249	synchroniz\$3 and (phase\$1 with clock signal\$1)	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2004/03/18 17:45
	<u> </u>		IBM_TDB	

19	15	((((((((((((clock distribution circuit) with (phase detector\$1)) and (generat\$3 and (clock signal\$1 with error signal\$1))) and (loop filter circuit)) and (pulse generator\$1 and (pulse signal\$1 with clock signal\$1))) and ("6066969" "6088255" "4816700" "5870595" "6041073" "4475085" "5212410" "5530102" "5990222" "5952857" "6239647" "4415984" "4479216" RE31828 "4613828" "4801819" "4905006" "5210546" "5257294" "5359232" "5562980" "5621705" "5628019" "5633879" "5646672" "5774321" "5787261" "5787261" "5805603" "5901116" "6052004" "6058152" "6078225" "6094076" "6160542"	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2004/03/18 17:45
		"6052004" "6058152" "6078225" "6094076" "6160542" "4361897" "4375088" "4376268" "4399412" "4454607" "4499459" "4512028" "4527075" "4542347"		
20	3861079	"4547667" "4557606" "4580047" "4580046")) and (summing and (error signal\$1 with composite error signal\$1))) and (arbiter circuit\$1)) and (synchronize local clock)) and (synchroniz\$3 and (phase\$1 with clock signal\$1)) integrated circuit	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2004/03/18 17:45

21	5 ((((((((((clock distribution circuit) with (phase detector\$1)) and (generat\$3 and (clock signal\$1 with error signal\$1))) and (loop filter circuit)) and (pulse generator\$1 and (pulse signal\$1 with clock signal\$1))) and ("6066969" "6088255" "4816700" "5870595" "6041073" "4475085" "5212410" "5630102" "5920222" "5952857" "6239647" "4415984" "4479216" RE31828 "4613828" "4801819" "4905006" "5210546" "5210546" "5257294" "5359232" "5459762" "5360839" "5612980" "5612980" "5621705" "5628019" "5633879" "5646672" "5774321" "5787261" "5787261" "5787261" "6058152" "6094076" "6160542" "4350048" "4375088" "4375088" "4375088" "4375088" "4375088" "4375088" "4375088" "4375088" "452075" "4542347" "454667" "4580047" "4580046")) and (summing and (error signal\$1 with composite error signal\$1))) and (synchronize local clock))	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2004/03/18 17:46
22 37360	and (synchroniz\$3 and (phase\$1 with clock signal\$1))) and (integrated circuit)	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2004/03/18 17:46

23	15	(generat\$3 and (clock signal\$1 with error signal\$1))) and (loop filter circuit)) and (pulse generator\$1 and (pulse signal\$1 with clock signal\$1))) and ("6066969" "6088255" "4816700" "5870595" "6041073" "4475085" "5212410"	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2004/03/18 17:46
		"5630102" "5920222" "5952857" "6239647" "4415984" "4479216" RE31828 "4613828" "4801819" "4905006" "5210546" "5257294" "5359232"		
		"5459762" "5600839" "5612980" "5621705" "5628019" "5633879" "5646672" "5724360" "5774321" "5787261" "5805603" "5901116"		
		"6052004" "6058152" "6078225" "6094076" "6160542" "4361897" "4375088" "4376268" "4399412" "4454607" "4499459"		
24	72849	"4527075" "4542347" "4547667" "4557606" "4580047" "4580046")) and (summing and (error signal\$1 with composite error signal\$1))) and (arbiter circuit\$1)) and (synchronize local clock)) and (synchroniz\$3 and (phase\$1 with clock signal\$1))) and (integrated circuit)) and (synchroniz\$3 with clock signal\$1) jitter\$1 or skew	USPAT;	2004/03/18 17:47
			US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	

		(generat\$3 and (clock signal\$1 with error signal\$1))) and (loop filter circuit)) and (pulse generator\$1 and (pulse signal\$1 with clock signal\$1))) and ("6066969" "6088255"	US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	
	:	clock signal\$1))) and ("6066969"	DERWENT;	
	:		IBM TDB	
		"6088255"	: / /	
		"4816700"		
į		"5870595"		
		"6041073"		
		"4475085"		
		"5212410" "FC20102"		
		"5630102" "5920222"		
		"5952857"		
.		"6239647"		
	ļ	"4415984"		
		"4479216" DE21020		
		RE31828 "4613828"		
		"4801819"		
		"4905006"]	
		"5210546"		
		"5257294"		
		"5359232" "5459762"		
		5459762 "5600839"		
		"5612980"		
		"5621705"		
		"5628019"		
		"5633879"		
		"5646672" "5724360"		
		"5774321"		
		"5787261"		
		"5805603"		
		"5901116"		
		"6052004" "6058152"		
		"6078225"		
		"6094076"		
		"6160542"		
		"4361897"		
		"4375088" "4375368"		
		"4376268" "4399412"		
		"4454607"		
+		"4499459"		
		"4512028"		
		"4527075" "4542247"		
		"4542347" "4547667"		
		"4557606"		
		"4580047"		
		"4580046"		
)) and (summing and (error signal\$1 with composite error		
		signal\$1))) and (arbiter circuit\$1)) and (synchronize local clock)) and (synchroniz\$3 and (phase\$1 with clock signal\$1))) and		
		(integrated circuit)) and (synchroniz\$3 with clock signal\$1)) and		
		(jitter\$1 or skew)		
26	2391	714/700.ccls. or 714/707.ccls. or 714/738.ccls. or 714/798.ccls. or	USPAT;	2004/03/18 17:50
		714/799.ccls. or 714/814.ccls. or 714/812.ccls.	US-PGPUB;	
			EPO; JPO; DERWENT;	
			IBM_TDB	



(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2002/0140477 A1 Zhou et al. (43) Pub. Date: Oct. 3, 2002

- (54) DUTY CYCLE CORRECTION CIRCUIT AND APPARATUS AND METHOD EMPLOYING SAME
- (76) Inventors: Jian Zhou, Plano, TX (US); Robert
 Payne, Plano, TX (US); Huanzhang
 Huang, Dallas, TX (US); Douglas
 Wente, Plano, TX (US)

Correspondence Address:
J. Dennis Moore
Texas Instruments Incorporated
P.O. Box 655474
Dallas, TX 75265 (US)

(21) Appl. No.: 09/820,193

(22) Filed: Mar. 28, 2001

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(57) ABSTRACT

The duty cycle for a periodic signal such as a clock signal is idealized by feeding back duty cycle information. Duty cycle information is detected by a capacitor connected in serial with a resistor across the outputs of a feedback differential transistor pair. Over time, the capacitor will be charged or discharged when the duty cycle varies from fifty percent. The detected duty cycle information is fed back to an amplifier where the incoming clock signal is mixed with the feedback signal. The amplifier itself comprises a first differential comparator stage receiving the uncorrected clock signal, a gain stage that amplifies and level shifts the feedback signal, and a second differential pair receiving the amplified feedback signal.

